MONITORING PLAN – Attachment 2 – Quality Assurance Project Plan
SWAMP RECREATIONAL USE STUDY
LABOR DAY WEEKEND 2008
CENTRAL VALLEY REGIONAL WATER QUALITY CONTROL BOARD
(22 September 2008)

The following pages contain the Quality Assurance Project Plan for this study.

TITLE AND APPROVAL SHEETS

Quality Assurance Project Plan

for

SWAMP RECREATIONAL USE STUDY
LABOR DAY WEEKEND 2008

September 22, 2008

Central Valley Regional Water Quality Control Board

Version 1.1

GROUP A ELEMENTS: PROJECT MANAGEMENT

1. TITLE AND APPROVAL SHEETS

Quality Assurance Project Plan

For

PROJECT NAME: **SWAMP RECREATIONAL USE STUDY LABOR DAY WEEKEND 2008**

Proposal Identification Number:

Date: September 22, 2008

NAME OF RESPONSIBLE ORGANIZATION : SWAMP – San Joaquin River Watershed Unit

APPROVAL SIGNATURES

Title:	Name:	Signature:	Signature Date:
CVRWQCB Project Manager	Anne Littlejohn		12/29/08
CVRWQCB Project Supervisor	Jeanne Chilcott		1/8/09
CVRWQCB QA Officer	Leticia Valadez		12/29/08

Note – This QAPP was amended from the original version 1.0 (dated 08/26/2008) to include the updated GPS locations of sample sites and clarification of personnel responsibilities.

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(NOTE – APPENDIX IS AVAILABLE FROM CVRWQCB SWAMP PROGRAM STAFF IN ELECTRONIC FILE AND ARE NOT PROVIDED AS PART OF THIS QAPP MAIN BODY DOCUMENT)

APPENDIX 1 – SAN JOAQUIN RIVER BASIN BACTERIA MONITORING PROGRAM

3. DISTRIBUTION LIST

Title:	Name (Affiliation):	Tel. No.:	No. of copies
Regional Board Project Manager	Anne Littlejohn (CVRWQCB)	(916) 464-4840	ORIGINAL
Regional Board Project Supervisor	Jeanne Chilcott (CVRWQCB)	(916) 464-4788	1
Regional Board QA Officer	Leticia Valadez (CVRWQCB)	(916) 464-4634	1
Joanne Hild	Executive Director/Biologist (Friends of Deer Creek)	(530) 265-6090	1
Ron Szmanski	Coordinator (Ebbetts Pass Forest Watch)	(209) 795-1726	1
Gregg Bates	Watershed Coordinator (American Basin Council of Watersheds)	(916) 771-2013	1
Richard F. Sloan	Coordinator (RiverTree Volunteers)	(559) 696-2971	1
Wendy Thompson	River Monitoring Program Coordinator (South Yuba River Citizens League)	(530) 265-5961 x205	1

Once approved, this QA plan will be available to any interested stakeholder group or participant by requesting a copy from Anne Littlejohn at alittlejohn@waterboards.ca.gov or 11020 Sun Center Drive #200, Rancho Cordova, CA 95670-6614. A copy of this QA plan will also be posted online during the duration of the study at:
http://www.waterboards.ca.gov/centralvalley/water_issues/water_quality_studies/surface_water_ambient_monitoring/index.shtml#rec_use_study

4. PROJECT/TASK ORGANIZATION

4.1 Involved parties and roles.
Anne Littlejohn will serve as the project manager for this study and will be responsible for all aspects of this study including stakeholder coordination, sample preparation, sample analysis, data analysis and reports. CVRWQCB SWAMP staff from San Joaquin River Watershed Unit and the Fresno and Redding offices will assist with these tasks. Steve Hulbert will serve as the main contact for the Fresno office and Guy Chetelat will serve as the main contact for the Redding office. Jeanne Chilcott will serve as the overall supervisor of the study and review the final site selection, results and reports.

Five stakeholder groups (Friends of Deer Creek, Ebbetts Pass Forest Watch, American Basin Council of Watersheds, RiverTree Volunteers and South Yuba River Citizens League) will assist with sample collection. Stakeholder contacts are listed in Table 1.

Table 1. (Element 4) Personnel responsibilities.

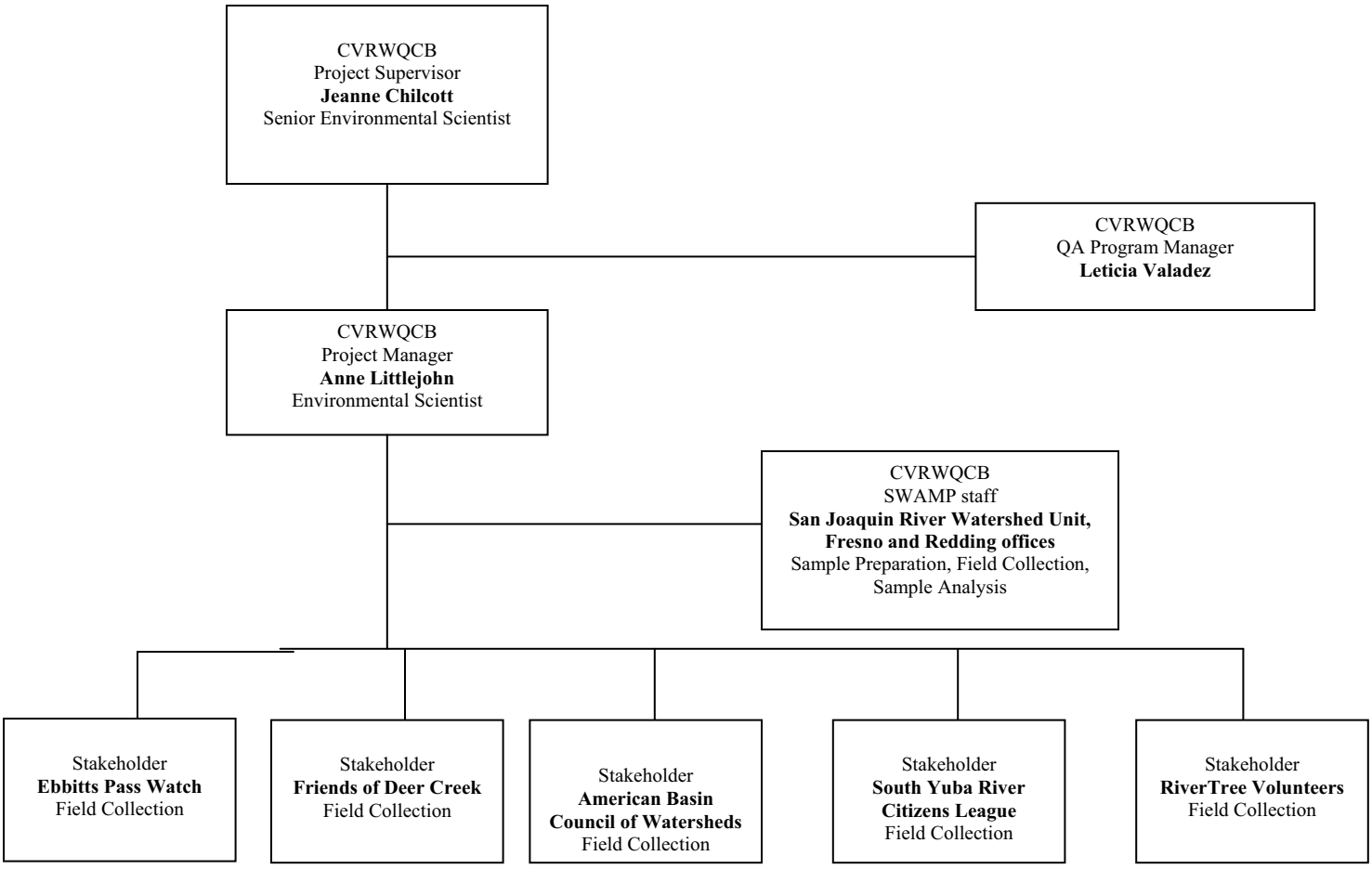
Name*	Organizational Affiliation	Title	Contact Information (Telephone number)
Anne Littlejohn	CVRWQCB	Environmental Scientist	(916) 464-4840
Steve Hulbert	CVRWQCB - Fresno	Engineering Geologist	(559) 444-2502
Guy Cheletat	CVRWQCB - Redding	Engineering Geologist	(530) 224-4997
Jeanne Chilcott	CVRWQCB	Senior Environmental Scientist	(916) 464-4788
Leticia Valadez	CVRWQCB	QA Officer	(916) 464-4634
Joanne Hild	Friends of Deer Creek	Executive Director/Biologist	(530) 265-6090
Ron Szymanski	Ebbetts Pass Forest Watch	Coordinator	(209) 795-1726
Gregg Bates	American Basin Council of Watersheds	Watershed Coordinator	(916) 771-2013
Richard F. Sloan	RiverTree Volunteers	Coordinator	(559) 696-2971
Wendy Thompson	South Yuba River Citizens League	River Monitoring Program Coordinator	(530) 265-5961 x205

4.2 Quality Assurance Officer role
Leticia Valadez is the QA Officer for CVRWQCB. Leticia's role is to establish the quality assurance and quality control procedures found in this QAPP as part of the sampling, field analysis and in-house analysis procedures.

4.3 Persons responsible for QAPP update and maintenance.
Changes and updates to this QAPP may be made after a review of the evidence for change QA Officer, Leticia Valadez and with the concurrence of Jeanne Chilcott. Anne Littlejohn will be responsible for making the changes, submitting drafts for review, preparing a final copy and submitting the final for signature.

4.4 Organizational chart and responsibilities (See section 4.1 for specific duties and responsibilities)

Figure 1. Organizational chart.



5. PROBLEM DEFINITION/BACKGROUND

5.1 Problem statement.
One of the purposes of the Surface Water Ambient Monitoring Program (SWAMP) is to determine whether there is any evidence that beneficial uses are not being protected. The Central Valley Regional Water Quality Control Board (CVRWQCB) Basin Plan identifies contact recreation as a beneficial use throughout the Region. The purpose of this study is to conduct an initial screening study of Recreation Beneficial Use in the Central Valley Region, using *E. coli* as the indicator. Sampling sites will consist of sites utilized by local stakeholders for contact recreation use (specifically, swimming holes, defined as places in fresh, moving water, such as rivers, streams, creeks, springs, or similar natural bodies of water, which are large enough and deep enough for a person to swim in. This excludes oceans and lakes).

5.2 Decisions or outcomes.
Using *E. coli* as an indicator, this study will help develop a snapshot of the water quality in local swimming holes before, during and after a major holiday (August 27 - September 3, 2008).

5.3 Water quality or regulatory criteria
The Central Valley Regional Water Quality Control Board (CVRWQCB) Basin Plan identifies contact recreation as a beneficial use throughout the Region. Although the Basin Plan identifies a water quality objective that utilizes fecal coliform (not to exceed 400 MPN/100mL in a single sample), *E. coli* can also be utilized as an indicator for potential pathogens and is a subset of fecal coliform. The U.S. EPA has developed contact recreation guidelines for *E. coli*, and an Amendment to the Central Valley Basin Plan is pending that would change the objective to terms of *E. coli*.

6. PROJECT/TASK DESCRIPTION

6.1 Work statement and produced products.
Samples will be collected from 72 sites (swimming holes) throughout the Central Valley Region, including the Sacramento and San Joaquin Basins. The project will measure pH, conductivity, temperature and collect bacterial (E. coli and total coliform) samples before, during and after Labor Weekend 2008 (August 27 – September 3, 2008). Table 2 summarizes the study sampling events.

Table 2. (Element 6) Study Sampling Events

Collection and Process	Sample Pull	Purpose
Wednesday, 27 Aug 2008	Thursday, 28 Aug 2008	Characterizing water quality prior to high recreation use period
Sunday, 31 Aug 2008	Monday, 1 Sept 2008	Characterizing water quality during the high recreation use period
Wednesday, 3 Sept 2008	Thursday, 4 Sept 2008	Characterizing water quality after high recreation use period

Table 3 shows the site locations and target geographical coordinates for each sampling event.

Table 3. (Element 6) Study Sampling Locations

Watershed	County	SWAMP Site Code	Site Description	Latitude	Longitude

American River	Placer	514AMR800	American River, North Fork, @ Yankee Jims Road	39.041133	-120.902417
American River	Placer	514AMR801	American River, North Fork @ Ponderosa Way	38.999600	-120.941050
American River	Placer	514AMR802	American River, North Fork at Confluence with Middle Fork	38.916267	-120.036300
American River	Placer	514AMR803	American River, Middle Fork @ Driver's Flat	38.963217	-120.932967
American River	Placer	514AMR804	American River, Middle Fork @ Mammoth Bar	38.917983	-121.001900
American River	El Dorado	514AMR805	American River, South Fork @ Lotus	38.803817	-120.909733
American River	El Dorado	514AMR806	American River, South Fork @ Kyburz	38.762950	-120.325617
American River	El Dorado	514AMR807	American River, Silver Fork @ China Flat campground	38.753600	-120.268067
American River	El Dorado	514AMR807	American River, Silver Fork @ China Flat campground; DAY USE AREA	38.751933	-120.266567
American River	El Dorado	514AMR808	American River, South Fork @ Salmon Falls Road	38.772733	-121.035200
American River	Sacramento	544SAC007	American River at Discovery Park	38.601706	-121.502675
American River	Sacramento	544SAC008	American River at Sunrise	38.633383	-121.270583
Big Chico Creek	Butte	520BUT901	Big Chico Creek @ Bidwell Park below swimming pool	39.762211	-121.792299
Butte Creek	Butte	520BUT900	Butte Creek @ Honey Run Bridge	39.729	-121.70528
Calaveras	Calaveras	533CAL900	Upper San Antonio Crk @ in-flow of White Pines Lake	38.2722	-120.34016
Calaveras	Calaveras	533CAL901	Upper San Antonio Crk @ out-flow of White Pines Lake	38.26736	-120.3443
Clear Creek	Shasta	508SHA903	Clear Creek @ SHY 273 bridge	40.5919	-122.393133
Clear Creek	Shasta	508SHA904	Clear Creek @ SHY 299 bridge	40.585762	-122.368199
Cosumnes	El Dorado	532ELD003	Cosumnes River at Gold Beach	38.5591667	-120.8463889
Cottonwood Creek	Shasta	508SHA900	Cottonwood Creek @ Interstate 5 bridge	40.377137	-122.2851
Cow Creek	Shasta	508SHA902	Cow Creek @ SHY 44 bridge	40.554932	-122.230904
Deer Creek	Nevada	516NEV906	Squirrel Creek in Western Gateway Park, Penn Valley	39.204047	-121.190609
Dry Creek	Placer	531PLA900	Dry Creek/ Cirby Creek confluence	38.733467	-121.2884833
Dry Creek	Placer	531PLA901	Dry Creek at Walegra Bridge	38.714479	-121.403438
Dry Creek	Placer	531PLA902	Miners Ravine/Secret Ravine Confluence	38.75975	-121.2566333
Dry Creek	Sacramento	531SAC900	Dry Creek @ Hayer Dam	38.680388	-121.4461667

Feather River - Middle Fork	Plumas	518PLU901	Feather River Middle Fork @ Sloat	39.86085	-120.72789
Indian Creek	Plumas	518INABSP	Indian Falls near HWY 89	40.05912	-120.96138
Kings River	Fresno	552HUM020	Ten Mile Creek @ Hume Lake	36.786778	-118.90042
Kings River	Fresno	552HUM030	Long Meadow Creek @ Hume Lake	36.787113	-118.913579
Kings River	Fresno	552KIN900	Kings River, South Fork @ Muir Rock and Hwy 180	36.793530	-118.583800
Kings River	Fresno	552KIN901	Kings River, South Fork @ Hotel Creek and Cedar Grove	36.789250	-118.669050
Kings River	Fresno	552KIN902	Kings River, South Fork@ Lewis Creek Trailhead	36.799340	-118.691600
Kings River	Fresno	552KIN903	Kings River, South Fork @ 180 & Cedar Grove	36.798070	-118.687530
Merced	Merced	535MER209	Merced River at Merced Falls	37.5180667	-120.3788333
Merced	Merced	535MER210	Merced River at Henderson Park	37.5216833	-120.4214667
Merced	Merced	537MAR900	"Patty's Hole", Merced River at El Portal	37.672167	-119.787483
Mokelumne	Amador	532AMA001	Mokelumne River, North Fork, at Hwy 26 Bridge	38.4233333	-120.5411111
Mokelumne	Amador	532AMA005	Mokelumne below Box Beach	38.3204833	-120.6863
Mokelumne	Calaveras	533CAL009	Mokelumne River, Middle Fork, at Hwy 26 Bridge	38.3894333	-120.5266333
Pit River	Shasta	506SHA950	Pit River @ Big Bend	41.02071	-121.91032
Sacramento River - Lower	Shasta	508SHA901	Sacramento River, Lower @ Anderson, Woodson Bridge Boat Ramp	39.905405	-122.08776
Sacramento River - Upper	Tehama	504TEH900	Sacramento River, Upper @ Red Bluff, east end of Willow Street	40.17177	-122.22455
Sacramento River - Upper	Shasta	506SHA951	Sacramento River, Upper @ Dog Creek confluence	40.938232	-122.417654
San Joaquin	Fresno	545FRE502	San Joaquin River @ Lost Lake County Park	36.973810	-119.737250
San Joaquin	Fresno	545FRE503	San Joaquin River @ Fort Washington Beach	36.888490	-119.787510
San Joaquin	Fresno	545FRE504	San Joaquin River @ Friant Cove	36.991090	-119.713610
San Joaquin	Madera	545MAD008	San Joaquin River @ Wildwood Native park	36.876050	-119.793580
Spanish Creek	Plumas	518PLU900	Spanish Creek @ USFS campground off HWY 70	40.00742	-120.96111
Stanislaus	Stanislaus	535STC201	Stanislaus River @ Knight's Ferry	37.8222222	-120.6597222
Tuolumne	Tuolumne	536TUO900	Tuolumne River, South Fork @ Rainbow Pools	37.821450	-120.012983
Yuba	Nevada	516NEV900	South Yuba River at Bridgeport	39.2926556	-121.1977752
Yuba	Nevada	516NEV901	South Yuba River at Purdon	39.3277057	-121.0473049

			crossing		
Yuba	Nevada	516NEV902	South Yuba River at Edwards Crossing	39.3326464	-120.9904472
Yuba	Nevada	516NEV903	South Yuba River Below Washington	39.3534575	-120.8085827
Yuba	Nevada	516NEV904	Rock Creek Below Lake Vera, below Dam	39.30237	-121.0282
Yuba	Nevada	516NEV905	Rock Creek Below Lake Vera, near Yuba	39.3120004	-121.0429516

6.2. Constituents to be monitored and measurement techniques.
Monitoring will consist of field measurements for pH, conductivity, and temperature. Samples will be collected for total coliform and *E. coli*. *E. coli* and total coliform will be analyzed using EPA's Standard Method 9223B (IDEXX Colilert ® QuantiTray system).

6.3 Project schedule

Table 4. (Element 6) Project schedule timeline.

Due Date	Category	Item
10 March	Monitoring Plan	Internal Review Draft
21 March	Supplies	Order supplies
8 April	Training	Redding Staff
29 May	Training	Fresno Staff
30 June	Stakeholder Group Coordination	Develop Contact List (SJR) w, input from Sac, Redding, Fresno SWAMP coordinators
30 June	Stakeholder Group Coordination	Staff Review Draft of Stakeholder Announcement and survey
16 July	Stakeholder Group Coordination	Final Announcement/ Mail out
31 July	Stakeholder Group Coordination	Stakeholder responses to mail out due
7 Aug	Monitoring Plan	Quality Assurance Project Plan (QAPP) Approval
8 Aug	Stakeholder Group Coordination	Electronic copies of Monitoring Plan, Procedures, and QAPP sent to interested stakeholders
mid Aug	Training	Redding Stakeholders Training/ Study Q&A Session/ Supply Distribution
mid Aug	Training	Lower Sacramento/ San Joaquin Stakeholders Training/ Study Q&A Session/ Supply Distribution
mid Aug	Training	Fresno Stakeholders Training/ Study Q&A Session/ Supply Distribution
26 Aug	Monitoring Plan	Add addendum to Monitoring Plan with Stakeholder Group Comments to include sampling site list
27Aug (W) 31 Aug (Su) 3 Sept (W)	Sample Collection	Before, During and After Labor Day Field samples
28 Aug (Th) 1 Sept (M) 4 Sept (Th)	Process, and Analyze	Process samples for *E.coli*

6.4 Geographical setting
This study is a region-wide study covering the Sacramento River, San Joaquin River and Tulare Lake Basins. Sampling sites will consist of sites utilized by local stakeholders for contact recreation use (specifically, swimming holes, defined as places in fresh, moving water, such as rivers, streams, creeks, springs, or similar natural bodies of water, which are large enough and deep enough for a person to swim in. This excludes oceans and lakes). See Table 3 in section 6.2 for specific site information.

6.5 Constraints
Special consideration to the availability of staff and volunteer stakeholders on a major holiday is needed during the site selection process. The maximum number of samples that can be processed by the Water Board Laboratories may further limit the scope of a valley wide survey.

7. QUALITY OBJECTIVES & CRITERIA FOR MEASUREMENT DATA

Data quality objectives for this project will consist of the following:

Field Measurements – Accuracy, Precision, Completeness
Bacterial Analyses – Precision, Presence/Absence, Completeness

Accuracy will be determined by measuring one or more selected from performance testing samples or standard solutions from sources other than those used for calibration. Accuracy criteria for bacterial testing will be based on presence/absence testing rather than numerical limits owing to the difficulty in preparing solutions of known bacterial concentration

Precision measurements will be determined on both field and laboratory replicates.

Completeness is the number of analyses generating useable data for each analysis divided by the number of samples collected for that analysis.

Method sensitivity is dealt with by the inclusion of the required SWAMP Target Reporting Limits, where such values exist, and by the application of the definition of a Minimum Level as provided by the Inland Surface Water and Enclosed Bays and Estuaries Policy. Target Reporting Limits exist for *E. coli*. No Target Reporting Limits were set for the field analyses.

Table 5. (Element 7) Data quality objectives tables.

Group	Parameter	Accuracy	Precision	Recovery	Target Reporting Limits	Completeness
Field Analyses	pH by meter	$\pm$ 0.5 pH units	$\pm$ 0.5 pH units	NA		90%
	Conductivity	$\pm$ 5%	$\pm$ 5%	NA		90%
	Temperature	$\pm$ 0.5 ^{o}C	$\pm$ 0.5 ^{o}C	NA		90%
Laboratory Analyses						
Bacterial Analyses	*E. coli*	Laboratory positive and negative cultures – proper positive or negative response. Bacterial PT sample -–within the stated acceptance criteria.	Rlog within 3.27*mean Rlog (reference is section 9020B of 18th, 19th, or 20th editions of Standard Methods	NA	2 MPN/100 mL	90%

Bacterial Analyses	Total Coliform	Positive results for target organisms. Negative results for non-target organisms	Rlog within 3.27*mean Rlog (reference is section 9020B of 18th, 19th, or 20th editions of Standard Methods	NA	2 MPN/100 mL	90%

Data collected from previous studies and held in SWAMP's database will be assessed against the same data quality objectives listed above. SWAMP holds field measurement data for pH, conductivity, temperature, *E. coli* and Total Coliform.

8. SPECIAL TRAINING NEEDS/CERTIFICATION

8.1 Specialized training or certifications.
Any stakeholder groups or CVRWQCB staff involved in sampling will be trained according to the SWAMP Procedures Manual for the San Joaquin River Basin Bacteria Monitoring Program. All records of training attendance will be stored at CVRWQCB's main office with the SWAMP-San Joaquin River Watershed Unit.

8.2 Training and certification documentation.
Field staff and stakeholder training is documented and filed with the CVRWQCB Project Manager. Documentation consists of a record of the training date and instructor.

8.3 Training personnel.
The CVRWQCB Project Manager, Anne Littlejohn and CVRWQCB student assistant, Calvin Yang will provide training.

9. DOCUMENTS AND RECORDS

CVRWQCB will collect records for sample collection, field analyses and bacterial testing. Samples sent from stakeholder groups will include a Chain of Custody form. CVRWQCB generates records for sample receipt and storage, analyses and reporting.

All records generated by this project will be stored at CVRWQCB's main office with the SWAMP-San Joaquin River Watershed Unit.

Copies of this QAPP will be distributed as indicated in Element 3 by the CVRWQCB Project Manager. Any future amended QAPP will be held and distributed in the same fashion. All originals of the first and subsequent amended QAPPs will be held at CVRWQCB. Copies of versions, other than the most current, will be discarded so as not to create confusion.

GROUP B: DATA GENERATION AND ACQUISITION

10. SAMPLING PROCESS DESIGN

Sampling sites are swimming holes that are selected based on a history of recreational use during holiday weekends. CVRWQCB staff will select sites based on stakeholder input and published sources. Samples will be collected to characterize water quality associated with contact recreation beneficial use during an anticipated high use time period. Each sample will be collected as a grab sample from each location on Wednesday August 27, 2008, Sunday August 31, 2008 and Wednesday September 3, 2008. Photo documentation of each site will be made on each collection date. Sample collection will be conducted during the time of day when swimming is most likely to occur (approximately 11 am to 5 pm). Samples will be stored on ice and transported to CVRWQCB's in-house laboratories for processing and analysis as described in Element 12 and Appendix 1. If sample locations are inaccessible or if water levels are too low for swimming, no collection will occur and a note indicating such will be made to the appropriate field sheet.

11. SAMPLING METHODS

Sampling methods will be followed according to the San Joaquin Basin Bacteria Monitoring Program manual (Appendix 1). The following is a summary of the sample preparation and collection methods:

FIELD RUN PREPARATION

For consistency and to ensure non-biased laboratory analyses, samples are labeled in accordance with the San Joaquin River Watershed Unit Procedures Manual.

Worksheets

- Field sheet
- Processing worksheet

Bottles:

Table 6. (Element 11) Bottle Sizes Based on Type of Sample

Bottle Size	Type of Sample	Frequency
120 ml	Normal Samples	Each
	Field Blank	1 Per Run
	Lab Blank	1 Per Run
	Field Duplicate	1 Set (2-120 mL bottles) Per 10 samples
290 ml	Lab Duplicate	1 Set Per 10 samples (1-290 mL bottle to be taken on the field run + 2-120 mL bottles to be left in the lab during the field run into which the 290 mL sample will be split)

Labeling:

- BAC is used in the following examples as the constituent analyzed. Traditionally, BAC has indicated *E. coli* and total coliform.

- The sample id codes must follow a standard format of INTYYMMDD-#Constituent ID, where
    - INT – the sampler collector's initials
    - YY – Year the samples were collected
    - MM – Month the samples were collected
    - DD – Day the samples were collected
- Side of the bottle – INTYYMMDD-#BAC with a waterproof marker.
- Top of the cap - #BAC with a waterproof marker
- Mark lab duplicate bottles with the normal and duplicate sample ID numbers.

Place the bottles **standing up** in the ice chest(s).
Ensure bottles are arranged so they will not tip over and that water from melted ice cannot seep in under the cap. Do not allow bottles to float in water.

Include extra empty bottles for potential problems that may arise and to keep the sample bottles from tipping while in transit.

***Bacteria Collection*:**

Photos should be taken at each site to visually document conditions

Bacteria samples require aseptic technique be used. Sample bottles are certified as factory sealed and sterilized. Keep sample bottles capped as much as possible. Dispose of bottles that are touched on the inside by anything other than the sample.

Two people will be needed for this procedure; one to collect the sample (Sampler 1) and one to hold the cap (Sample 2). This procedure is used to minimize potential for contaminants to fall in the cap or bottle, and in lieu of uncapping the bottle under the water surface.

1. Secure the bacteria bottle on the clamp

2. Remove the shrink band from bottle.

3. Sampler 1 will then condition the bottle and pole by triple rinsing with the water to be collected prior to sample collection.

4. Sampler 2 will remove the cap from the bottle.

5. Sampler 1 will then collect the sample.
    a. Keep bottle right side up.
    b. Tilt the bottle so that the opening is facing upstream.
    c. Push the bottle forward, horizontally, under the water body surface.
    d. Fill the bottle as close to the 100 ml mark (or 250ml if duplicate) as possible, without going under the line.
    e. Remove excess sample water from the bottle by tilting slowly to dump any extra sample water and then re-check.
6. Sampler 2 then caps the bacteria bottle, and unclamps sample.

12. SAMPLE HANDLING AND CUSTODY

Once sample containers are filled they are stored on ice for transport to the CVRWQCB's in-house laboratory. Bacteria Processing Sheets will be used as the Chain of Custody form and will be signed by the sample collector and provided to CVRWQCB laboratory staff along with any field sheets and notes.

Sample containers for bacterial testing will be 120mL sterilized plastic bottles. Sodium thiosulfate is pre-added to the containers and no preservation is needed following the sampling event.

Sample holding times are as follows:

Maximum hold time allowed is 6 hours at 4°C for regulatory purposes. For non-regulatory purposes, samples must be processed within 24 hours at 4°C. This study is for non-regulatory purposes. Samples must be kept in a dark location while they are being held.

Aseptic technique is required for processing bacteria samples.

Samples must be disposed of properly in biohazard trash cans when analysis is completed and all analytical quality assurance/quality control procedures are reviewed and accepted.

13. ANALYTICAL METHODS

The following analytical procedures are used in this project.

Table 7. (Element 13) Analytical methods

Analyte	Laboratory / Organization	Project Action Limit (units, wet or dry weight)	Project Quantitation Limit (units, wet or dry weight)	Analytical Method		Achievable Laboratory Limits	
				Analytical Method	Modified for Method yes/no	MDLs (1)	Method (1)
pH	Field monitoring by CVRWQCB staff or stakeholders	6 - 9 pH units	NA	Standard Methods (*) 4500H	None		
Conductivity	Same	> 1500 micromhos	10 micromhos	Standard Methods 2510B	None		
Temperature	Same	None	-5 ° C	Standard Methods 2550B	None		
E. coli	CVRWQCB In-house laboratory	< 20 MPN/100mL for *E. coliforms*	2 MPN/100mL	Standard Methods 9223B Enzyme substrate method	None	Not applicable	2 MPN/100 mL
Total Coliform	CVRWQCB In-house laboratory	< 20 MPN/100mL for *E. coliforms*	2 MPN/100mL	Standard Methods 9223B Enzyme substrate method	None	Not applicable	2 MPN/100 mL

(*) *Standard Methods for the Examination of Water and Wastewater*, 20th edition.

A full description of the methods used for bacteria processing and analysis is provided in Appendix 1.

14. QUALITY CONTROL

Sampling

Quality assurance and quality control activities for sampling processes include the collection of field replicates for bacterial testing and the preparation of field blanks. Lab blanks and Lab duplicates will also be part of the quality control plan. The following table describes the type and size of samples that will be taken:

Table 8. (Element 14) Normal and QA Samples

Bottle Size	Type of Sample	Frequency
120 ml	Normal Samples	Each
	Field Blank	1 Per Run
	Lab Blank	1 Per Run
	Field Duplicate	1 Set (2-120 mL bottles) Per 10 samples
290 ml	Lab Duplicate	1 Set Per 10 samples (1-290 mL bottle to be taken on the field run + 2-120 mL bottles to be left in the lab during the field run into which the 290 mL sample will be split)

Blanks will be prepared by pouring Phosphate Buffered Saline, known to be free of the substance of interest, into a sample collection container then subsampling into the appropriate number of replicate sample containers.

Field Measurements

Measurement devices for pH, temperature and conductivity will be checked against a standard whose source is different than that selected for calibration.

Bacterial Testing

The laboratory will analyze the field blanks submitted. The expected result is the absence of total *E. coli*.

15. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

Field measurement equipment will be checked for operation in accordance with the manufacturer's specifications. This includes battery checks, routine replacement of membranes, and cleaning of conductivity electrodes. All equipment will be inspected when first handed out and when returned from use for damage.

Equipment associated with bacterial analyses is checked in accordance with the specifications of Standard Methods 9223B. In particular, the incubators are checked before samples are placed in and taken out. The temperature must be within $35 \pm 0.5\ ^{o}C$. The sealer and UV Lamp are inspected monthly. A full description of equipment testing, inspection and maintenance is described in Appendix 1.

16. INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Immediately before use in the field, pH and conductivity measurement devices will be calibrated against standards.

There are no calibration procedures for bacterial testing.

17. INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Supplies will be examined for damage by CVRWQCB staff as they are received. The following supplies will receive additional checks as follows.

pH and conductivity standards will be checked by comparing their readings with those generated by the current lot of standards. Standards must agree exactly.

Bacterial media will be checked against positive, negative and sterility checks. These checks are the same as those described in section 15.

18. NON-DIRECT MEASUREMENTS

The only non-direct measurements are from the SWAMP's database of data from prior studies. The database is maintained in accordance with SWAMP's policy as stated earlier. The data will be reviewed against the data quality objectives stated in section 7 and only that data meeting all of the criteria will be used in this project.

19. DATA MANAGEMENT

Data will be maintained as established in section 9 above. CVRWQCB (San Joaquin River Watershed Unit) will maintain an inventory of data and its forms. Individual data sheets will be backed up on the CVRWQCB network server by the Project Manager. Data will be entered into the SWAMP database by CVRWQCB staff. Data will also be available on the internet via the CVRWQCB website.

GROUP C: ASSESSMENT AND OVERSIGHT

20. ASSESSMENTS & RESPONSE ACTIONS

All reviews will be made by the CVRWQCB QA Officer. If an audit discovers any discrepancy, CVRWQCB's QA Officer will discuss the observed discrepancy with the appropriate person responsible for the activity (see organization chart). The discussion will begin with whether the information collected is accurate, what were the cause(s) leading to the deviation, how the deviation might impact data quality, and what corrective actions might be considered.

The CVRWQCB QA Officer has the power to halt all sampling and analytical work by the project team if the deviation(s) noted are considered detrimental to data quality.

21. REPORTS TO MANAGEMENT

Interim and final reports will be issued by CVRWQCB according to the following table.

Table 9. (Element 21) Report Due Dates

Due Date	Category	Item
31 Sept	Writeups	Draft Data compiled and sent to participants
15 Oct	Writeups	Summary Site Templates Completed and sent to participants
14 Nov	Writeups	Draft Study Report for Peer Review
14 Nov	Writeups	Draft Study Report for Participant Review
31 Dec	Writeups	Final Report for post to website

GROUP D: DATA VALIDATION AND USABILITY

22. DATA REVIEW, VERIFICATION, AND VALIDATION REQUIREMENTS

Data generated by project activities will be reviewed against the data quality objectives cited in Element 7 and the quality assurance/quality control practices cited in Elements 14, 15, 16, and 17. Data will be separated into three categories: data meeting all data quality objectives, data failing precision or recovery criteria, and data failing to meet accuracy criteria. Data meeting all data quality objectives, but with failures of quality assurance/quality control practices will be set aside until the impact of the failure on data quality is determined. Once determined, the data will be moved into either the first category or the last category.

Data falling in the first category is considered usable by the project. Data falling in the last category is considered not usable. Data falling in the second category will have all aspects assessed.

23. VERIFICATION AND VALIDATION METHODS

All data records will be checked visually and recorded as checked by initials and dates. The CVRWQCB Project Manager will do all review of the data and the CVRWQCB Project Supervisor will review all summary reports of the data.

Issues will be noted. Reconciliation and correction will be done by a committee composed of CVRWQCB's QA Officer, Project Manager and Project Supervisor. Any corrections require a unanimous agreement that the correction is appropriate

24. RECONCILIATION WITH USER REQUIREMENTS

The project needs sufficient numbers of data points, as represented by the completeness data quality objective in order to do trend analyses, define the areas of elevated bacteria concentrations within the Central Valley Region and determine the impact from recreational use during a holiday weekend. A failure to achieve the numbers of data points cited could mean an inability to provide these assessments